THE DENTAL PRACTITIONER

A Journal of Dental Science for the Practitioner

VOL. IV, NO. 11 JULY, 1954

[*Incorporating the Proceedings of the British Society of Periodontology and the Transactions of the British Society for the Study of Orthodontics*]

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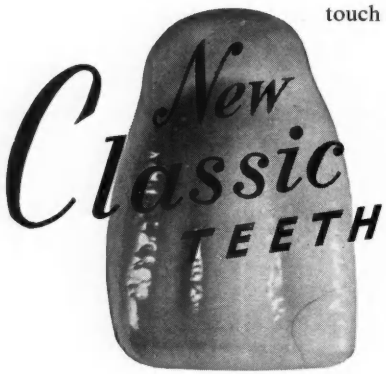

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THE DENTAL PRACTITIONER

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(Incorporating the Proceedings of the British Society of Periodontology, and the Transactions of the British Society for the Study of Orthodontics)

Joint Editors:

JOHN E. SEEAR, L.D.S. R.C.S. N. LIVINGSTONE WARD, L.D.S., D.D.S.

Associate Editors:

H. MANDIWALL, M.B., B.S., L.D.S. DONALD F. SOUL, F.D.S. R.C.S.

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EDITORIAL

ASPECTS OF RESEARCH

In defining the word "research" the Oxford Dictionary states that it may mean a careful search or inquiry, an endeavour to discover facts from a scientific study of a subject, or lastly, as a course of critical investigation. Any dictionary definition of a word that is open to more than one specific meaning may lead to a battle of words, and research is no exception. One may always ask "how careful" or "what is a scientific study"? Generally speaking there is little debate on the use of the word in its strict scientific meaning, providing that scientific is defined first without quibbling. In the broader sense of the word controversy may arise as the word usually implies a standard of accuracy above normal. A careful inquiry into a specific subject may be rejected as unscientific because of the lack of certain controls, but may still come under the heading of research. There is one fact, however, that stands out clearly: any type of research must be based on acute and accurate observation. It is the critical eye of the investigator that may turn routine examination into worth-while research.

Dental research should be allied to general practice, for all research is undertaken with a view to improvement, through increased knowledge, of diagnosis, treatment, and prevention. From a theoretical concept the true object of pure dental research is the abolition of dentistry. Until that day dawns the general practitioner must carry on with his life's work, and dentistry is dedicated to a constant careful inquiry into the conditions of the patient's mouth. Hence each and all of us are to varying degrees research workers in the field of dental surgery. Tremendous opportunities for increased knowledge are missed by the profession by not correlating and publishing their numerous case-histories. They may not come under the heading of highly scientific, but then they are not meant to; nevertheless, they are of great importance to the profession. Admittedly there is always the plea of time, an expensive item these days, but surely this must be balanced against the ultimate good that results from an accumulation of knowledge. Recent articles published in this journal together with those in this particular issue show that there are many professional men who keep alight the torch of research, to the betterment of their profession and their patients.

RAVOCAINE

(2-Diethylaminoethyl 4-amino-2-propoxybenzoate hydrochloride)

A CLINICAL STUDY OF A NEW LOCAL ANÆSTHETIC

By **ROBERT CUTLER,** L.R.C.P. (Lond.) M.R.C.S., L.D.S. (Eng.)

Of all subjects likely to engage the keen interest of the general practitioner, local anæsthesia takes pride of place, as he realizes the possibility that infliction of pain in dental procedures forms the chief psychological barrier between himself and his patient, and, whilst many factors are relevant to this prevention of pain, he knows the surest answer lies in the efficiency of the local anæsthetic of his choice.

Manufacturers for their part have shared this interest, and the multiplicity of new preparations introduced throughout the present century gives some idea of the thought and effort devoted to this subject. In the final analysis two qualities, and two only, are of decisive importance, and whilst many other useful attributes may be desired, or claimed, for any given product they do not in effect influence the issue in any material respect. These two qualities are: (1) A high degree of potency to give an adequate operating margin, if administrative technique is not perfect or local conditions not wholly favourable; (2) Freedom from toxic, or disagreeable, general, or local, side-effects.

Many desirable qualities can be envisaged—such as (1) Rapidity of action; (2) Rapidity of elimination; (3) Freedom from after-pain; (4) Good shelf life; (5) Inability to provoke skin sensitization of the operator's hands; (6) Convenient dispensing in cartridge form; (7) Reasonable cost, etc.—and during the long period when the basic ingredient has been unchanged it is these features that have had unremitting, and on the whole rewarding, attention from manufacturers.

With the introduction of Novocain by Bayer in 1905, a drug of adequate potency was made available, and early experience with the use of adrenaline as a vasoconstrictor additive in 1901 by Braun in his work on cocaine, pointed the way to the employment of this drug with the newly discovered product. The Novocain-adrenaline combination fulfilled in some considerable measure the basic criteria laid down, and has formed the pattern on which all later preparations have been devised for a period of nearly forty years. Up to 1930 quite high adrenaline concentrations were very usual, for example, Waite's Procaine No. 4 solution available in the 1930's had an adrenaline content of 1–25,000, and perhaps the only major advance was the introduction of the synthetic vasoconstrictor, cobefrin (1934), which potentiated the standard procaine solution to an adequate intensity, and largely eliminated the troublesome side-effect inherent in adrenaline administration: indeed, it might be fair to say that although the procaine-adrenaline preparations remained the combination of choice for many practitioners, the procaine-cobefrin combination proved to be the pattern for the newer preparations of the last few years. It was, however, generally recognized that these new preparations represented no basic departure from the original product, and whilst minor improvements were appreciated, little more could be hoped for in overall efficiency. In 1950, however, a new drug, "lignocaine" (B.P.),* forming the group of "xylocaine" preparations, was introduced, having a potency so clinically superior to the old procaine preparations that it seemed that the virtual fifty-year reign of the procaine products was at an end. It is true that the new drug depended on the addition of a low concentration of adrenaline, 1–80,000, to show itself to such easily demonstrable advantage, and any claim that the new drug was itself neurotrophic could hardly be substantiated, in view of its relative inefficiency when used alone. Considerable literature is available regarding this drug (Thexton, Wishart, and Baxendine, 1950), and clinical evaluation

* Proprietary preparations include Xylocaine and Xylotox.

leaves no doubt that it satisfies the two basic criteria specified, and it unquestionably represented one of the major advances in post-war dentistry. It was found to satisfy the minor criteria in most respects, though a stinging sensation on injection, and some delay in elimination have been recorded. Clinical workers generally, in accepting the new product, none the less realized that the simple procaine-cobefrin type of anæsthetic, now clearly shown to be inferior in respect of maximal potency, still had a useful field of application for cases of frail and elderly patients, those sensitive to adrenaline, and those with gross myocardial defect; and a new development in the procaine field has stimulated fresh interest, raising the intriguing possibility of a new span of life for this time-honoured drug, to the advantage of dentist and patient alike. Here again the basic criteria are satisfied, the noteworthy feature being full potency without the addition of adrenaline, and a virtually complete freedom from undesirable side-effect. A quantity of the new material was made available to the author for a pilot test in July, 1953, clinical experiences in connexion with which are later described, the quite outstanding feature being its successful employment in clinical cases of extreme senile frailty and gross myocardial defect, in which exhibition of a standard preparation with adrenaline would have been contra-indicated, or, if used, fraught with real anxiety on the part of the operator. It was, in fact, this feature that stimulated the author to a more comprehensive test of the new material, which assumes some practical interest, as it is understood the material is now available in the home market.

This new material, Ravocaine (2-diethylaminoethyl 4-amino-2-propoxybenzoate hydrochloride) is in effect a complex derivation of procaine, and in a 0·4 per cent strength is combined with 2 per cent procaine and cobefrin 1–10,000; the test quantities made available to the author adhering strictly to this formula. The first batches were not subjected to closely controlled conditions, in order to get the "feel" of the material, but its use in certain selected cases, as before described, was found to be so outstandingly good that a more comprehensive survey was undertaken towards the end of 1953. As a basic requirement, it was felt the new material should satisfy the two criteria mentioned at the commencement of this article, though the high average efficiency of local anæsthetics available to-day showed that an accurate comparative evaluation could only be secured by very large scale closely controlled "blind" testing under hospital or institutional conditions. The issue is further confused by the advances in operative technique, the management of the wound in exodontia, and the post-operative local employment of antibiotics, which have eliminated many of the sequelæ now known to have been wrongly attributed to the anæsthetic employed, post-operative pain and "dry-socket" for example; and it rapidly became clear that observation of specific characteristics should be confined to narrow limits, and have little or no regard to makers' claims. For example, it is universally recognized that the upper premolars are amongst the easiest to anæsthetize, and a claimed "100 per cent success rate for extractions" would be wholly misleading if the series quoted covered exodontia in this area only. It was, therefore, decided to use the material *for every consecutive case in day-to-day practice*, as the preliminary test had shown a reassuring degree of freedom from gross side-effect, and tabulated notes were taken of each case, in accordance with the questionnaire shown on page 340.

Some of the points specified could not be checked, but the value of the questionnaire rapidly became obvious, as certain of the postulated possible side-effects were virtually absent, and as the test proceeded a "satisfactory" or "not satisfactory" rating could be given to each case without prolonged individual consideration.

Before defining the latter criteria it would be interesting to consider in what ways the material gave no cause for anxiety whatever. Onset was conveniently rapid, those cases in which onset was slow being almost invariably unsatisfactory in depth of anæsthesia and classified as such. Return to normal (elimination of patient's feeling of numbness, etc.) was

never unduly prolonged, and there was no single complaint in the series of numbness persisting for a period of many hours. This is notoriously a difficult matter to assess as a posterior superior alveolar injection may give the patient virtually no discomfort, whereas a

THE QUESTIONNAIRE

Name or Case No...... *Age*..... *Date*.....

Operation:—
(*Please tick*)
Conservation.. Extraction { Simple.. / Difficult.. / Surgical.. } Apicectomy..

Area:—

Injection:—(*Please tick*)
Submucous..
Regional..
Number of Cartridges used..

Grade of Anæsthesia:—
(A)..... (B)..... (C)..... (D).....

Onset....minutes
Operating time....minutes
Return to normal.... minutes

Patient's Oral Hygiene:—
Good..
Moderate..
Bad..

Reactions:—(*Yes or No*)
Pain on injection ?
Palpitation ?
Fainting ?
Degree of Bleeding.
(Freely, moderate, slight.)
Other points : Case history, etc.

Post Operative:—
Pain ?
Swelling ?
Dry Sockets ?
Etc.

Grades of Anæsthesia:—
(A) Complete elimination of pain.
(B) Injection not repeated but some pain.
(C) Re-injection necessary.
(D) Poor or no anæsthesia.

Note.—Definitions. Onset:—Time anæsthesia develops sufficiently to enable operator to proceed.

mental or incisal infiltration may cause inconvenience in drinking, smoking, etc., and is commented upon by the patient. As regards reactions in the whole series (126), there was no single case of fainting, and no single case of difficulty in proceeding with the operation, and because of this outstanding characteristic, every case in which there was any departure from the normal feeling of well-being is described below in the form of clinical notes. Pain on injection was absent, no surface anæsthetic being used, and this is only worthy of comment in the sense that with some solutions a "stinging" or tingling sensation may be described. "Freedom from pain on injection" is another attribute needing the most precise qualification, as painless submucous infiltration in the upper premolar area is possible for all but the most inept operator, whereas injection in the upper incisor region immediately beneath the nose, or in the mental area, when the foramen is being sought by the advancing needle, may well be uncomfortable even in the hands of the most experienced dental surgeon. The use of a short needle, surface anæsthetic, and a deft technique are so universally practised that, in general, freedom from pain on injection can hardly be regarded as a distinguishing feature peculiar to any one anæsthetic to-day, though it was noticed that the solution could be given rapidly without evidence of distress: this, however, is not to be recommended as a desirable procedure, and is not further considered. Post-operative bleeding was normal, this being noteworthy in intra-osseous injections, but apart from this type of injection it should be recognized that for infiltration and block injection techniques normal bleeding (so essential to the modern conception of care of the post-operative wound) seems to be in no way impeded by adrenaline concentration of 1–80,000 or less, so this does not constitute a distinguishing factor.

Post-operatively, undesirable sequelæ as shown on the questionnaire were completely absent, though, as before stated, modern surgical techniques have in themselves virtually eliminated the phenomenon of "dry socket", and its absence from this series is probably of no significance.

Consideration of the above factors having been completed and held for inclusion in the later evaluation, the consecutive cases handled, representing every type of procedure met with in day-to-day private practice, were classified into "satisfactory" or "unsatisfactory" groups; the "satisfactory" covering all those cases in which the chosen operation was completed without pain or side-effect distress to the patient, with every indication of a full anæsthesia, and with absence of any post-operative sequela clearly due to the injection.

The term "side-effect distress" must be further elaborated, as it is this which intimately concerns the patient and may well prejudice the conduct and success of the operation, irrespective of any added burden of anxiety to

the operator. Very minor degrees of side-effect distress are typical of any injection containing adrenaline, assuming a full treatment dose, and are often described by the patient as "feeling funny for a moment" or "weak in the legs"—a curious observation this, as the patient is, of course, seated, and even when the patient does not comment, the trained and observant operator can often detect minor signs, like a faint perspiration on the upper lip, a laxness of the arms as they rest on the chair sides, a break in the level of conversation, or train of thought in the patient's mind at the time, all these signs *following* the actual injection itself. Such signs vary in degree from a transient sense of vague unease, to

BATCH D

Case No.	*Age*	*Area*	*Operation*	*Result*
1	35	43	Conservation	S.
2	28	765	Conservation	S.
3	35	8	Conservation	S.
4		8	Simple extraction	S.
5	75+	11	Simple extraction	S.
6	40	45	Conservation	S.
7	30	8	Difficult extraction	S.
8	20	4	Conservation	S.
9		7	Simple extraction	S.
10	60	11	Simple extraction	S.
11	68	5	Simple extraction	S.
12	25	8	Simple extraction	S.
13	28	4	Conservation	S.
14	50	3	Conservation	S.
15	21	4	Conservation	S.
16	50	8	Simple extraction	S.
17	21	8	Simple extraction	S.
18	67	8	Simple extraction	S.
19	58	6	Conservation	US.
20	55	6	Conservation	US.
21	25	6	Conservation	S.
22	28	64	Conservation	S.
23	45	32	Conservation	S.
24	41	6	Conservation	S.
25		83	Conservation	S.

S.=Satisfactory; US.=Unsatisfactory.

Total 25: Satisfactory 23; Unsatisfactory 2.

BATCH B

Case No.	*Age*	*Area*	*Operation*	*Result*
26	16	56	Conservation	US.
27	16	45/5	Conservation	US.
28	44	67	Conservation	US.
29		6	Simple extraction	US.
30	44		Simple extraction	US.
31	45	8	Conservation	US.
32	68	32	Simple extraction	US.
33		37	Conservation	S.
34	15	6	Conservation	S.
35	70	4		S.
36			Conservation	S.
37	56	78	Conservation	S.
38	18	67	Conservation	S.
39	28	5		S.
40	38	7	Conservation	S.
41	72	5	Simple extraction	S.
42	55	3	Conservation	S.
43	49		Simple extraction	S.
44	16	6	Conservation	S.
45	20		Simple extraction	S.

S.=Satisfactory; US.=Unsatisfactory.

Total 20: Satisfactory 13; Unsatisfactory 7.

BATCH A

Case No.	*Age*	*Area*	*Operation*	*Result*
46	50	6	Conservation	US.
47		6	Conservation	US.
48	20	567	Conservation	US.
49	17	8	Conservation	S.
50	30	6	Conservation	S.
51	45	7	Conservation	S.
52	16	6	Conservation	S.
53	22	345	Conservation	S.
54		5	Conservation	S.
55	60	3	Simple extraction	S.
56	15	6	Conservation	S.
57	40	4	Conservation	S.
58	18	7	Conservation	S.
59	25	7	Simple extraction	S.
60		6	Conservation	S.
61	25	8	Surgical extraction impacted	S.
62	18	7	Conservation	S.
63	20	678	Conservation	S.
64	45	8	Conservation	S.

S.=Satisfactory; US.=Unsatisfactory.

Total 19: Satisfactory 16; Unsatisfactory 3.

BATCH H

Case No.	*Age*	*Area*	*Operation*	*Result*
65	46	76	Conservation	S.
66	32	6	Conservation	S.
67	34	8	Simple extraction	S.
68	48	6	Surgical extraction	S.
69	30	456	Conservation	S.
70		234	Conservation and simple extraction	S.
71		6	Conservation	S.
72	40	37	Conservation	S.
73		543	Conservation	S.
74	18	5	Conservation	S.
75	44	5	Surgical extraction	S.
76		8	Simple extraction	S.
77	14	4	Conservation	S.
78	28	5	Conservation	S.
79	45	6	Conservation	S.
80	17	623	Conservation	S.
81	36	5	Conservation	S.
82	46		Simple extraction	S.
83	40	7	Conservation	US.
84	60	32	Conservation	US.
85	14	6	Conservation	US.

S.=Satisfactory; US.=Unsatisfactory.

Total 21: Satisfactory 18; Unsatisfactory 3.

collapse making operative procedures impossible, and it is not suggested that the lesser degress of reaction constitute in any practical sense a bar to the use of adrenaline; indeed it can reasonably be claimed that with an anæsthetic medium of high potency, the total dose given can be minimal so that the total adrenaline dose would also be small. None the less, if it is possible to eliminate or minimize these reactions by employment of a synthetic vasoconstrictor, it would seem reasonable to do so.

The "unsatisfactory" cases comprised those in which there was failure to secure a full working anæsthesia, and particularly those in which errors in injection technique were unlikely. Possible causes of failure to secure anæsthesia well recognized by the clinician have been noted, as for example highly congested states of nerve and periodontal tissue, but in so far as such cases when successfully injected were classed in the "satisfactory" group, the unsuccessful ones must be ranked "unsatisfactory".

In this "unsatisfactory" group were included *all* cases showing even the slightest

BATCH G

Case No.	*Age*	*Area*	*Operation*	*Result*
86	18	78	Conservation	S.
87	17	76	Conservation	S.
88	42	3	Conservation	S.
89		5	Conservation	S.
90		43	Conservation	S.
91	35	1	Apicectomy	S.
92	13		Simple extraction	S.
93	35	5	Conservation	S.
94	42	54	Conservation	S.
95		3	Surgical extraction	S.
96	17	6	Conservation	S.
97	30	6	Conservation	S.
98	35	21	Simple extraction	S.
99	15	65		S.
100		8	Simple extraction	S.
101		76	Conservation	S.
102		2	Simple extraction	S.
103	19	7	Conservation	S.
104	10	6	Conservation	S.
105	14	6	Conservation	US.
106	45	5	Simple extraction	US.
107		7	Conservation	US.

S.=Satisfactory; US.=Unsatisfactory.

Total 22: Satisfactory 19; Unsatisfactory 3.

BATCH C

Case No.	*Age*	*Area*	*Operation*	*Result*
108	15	6	Conservation	US.
109	16	6	Conservation	US.
110	74	3	Simple extraction	S.
111	55	4	Conservation	S.
112	45	78	Conservation	S.
113	60	7	Surgical extraction	S.
114	47	6	Extraction	S.
115	40	56	Conservation	S.
118		7	Conservation	S.
117	16	74	Conservation	S.
118		8	Simple extraction	S.
119	48		Simple extraction	S.
120	38		Surgical extraction	S.
121	55	73 347	Simple extraction	S.
122	17	7	Conservation	S.
123	49	74	Simple extraction	S.
124	17	7 6	Conservation	S.
125	14	6	Conservation	US.
126	15	5	Conservation	US.

S.=Satisfactory; US.=Unsatisfactory.

Total 19: Satisfactory 15; Unsatisfactory 4.

SUMMARY OF RESULTS

Cases Reported	*Satisfactory*	*Unsatisfactory*
126	104	22

Thus percentage satisfactory=82·5.

ANALYSIS OF UNSATISFACTORY CASES

Case 19: Devitalization of lower molar with clinical signs of congested pulp (comment *see* text).
Case 20: Somewhat highly strung patient: incomplete anæsthesia.
Case 26: Incomplete anæsthesia.
Case 27: Incomplete anæsthesia in mental injection area. Upper premolar injection normal.
Case 28: Incomplete anæsthesia after full dose. Somewhat highly strung patient.
Case 29: Incomplete anæsthesia.
Case 30: Incomplete anæsthesia, later complete after re-injection.
Case 31: Incomplete anæsthesia: patient, tall heavily built man, gave history that dental injections "did not work" on him.
Case 32: Incomplete anæsthesia after maximum dose.
Case 46: Incomplete anæsthesia, even after re-injection (mandibular), lip numb, but tooth sensitive to cold spray.
Case 47: Incomplete anæsthesia.
Case 48: Incomplete anæsthesia (mandibular), complete anæsthesia on re-injection.
Case 83: Incomplete mandibular anæsthesia, almost certainly faulty technique.
Case 84: Unsuccessful mental injection: mental injection point difficult to localize.
Case 85: Incomplete anæsthesia—no explanation.
Case 105: Incomplete anæsthesia.
Case 106: Some pain felt on extraction, congested tooth with actual abscess. Case not suited for general anæsthetic. Result not significant.
Case 107: Mandibular injection. No anæsthesia and some transient pallor which rapidly passed off.
Case 108: Quite distinct pallor on injection, passed off rapidly. Complete anæsthesia.
Case 109: Distinct pallor: patient said he "felt queer", passed off rapidly. Complete anæsthesia.
Case 125: Incomplete anæsthesia.
Case 126: Incomplete anæsthesia—no explanation.

degree of side-effect distress, and these have short clinical notes appended. Such cases are notoriously difficult to assess, as deep-seated psychological factors may play a leading part: lack of tone in the cerebral blood-vessels is, for example, not infrequently met with, and the writer has two patients of the same family who can only be treated for a few minutes at a time in the full upright position; if treated in the more normal semirecumbent position for a longer period, both patients go off in a dead faint, rendering further procedures impossible: both are young adults of tranquil disposition leading active normal lives.

Case No.	*Age*	*Operation*	*Injection*	*Area*	*Result*	*Comments*
1	45	Conservation	Infiltration	467	S.	Slight pallor
2	46	Conservation	Mental	4	S.	
3	40	Conservation	Infiltration	6	S.	
4	46	Conservation	Mental	5	S.	
5	40	Conservation	Infiltration	478	S.	
6	46	Conservation	Infiltration	2347	S.	Pallor—uncertainty 10 min.
7	24	Conservation	Infiltration	6	S.	
8	41	Conservation	Infiltration—Mental	3 2	S.	
9	40	Conservation	Infiltration	5	S.	
10	40	Conservation	Infiltration	3	S.	
11	49	Conservation and extraction	Prepare surgical extraction	7 4	S.	
12	46	Extraction			Not perfect	Probably faulty technique
13	40	Extraction		1	S.	Some pallor
14	48	Conservation	Infiltration		S.	
15	40	Conservation	Infiltration	5	S.	
16	35	Conservation			S.	Fixing bridge
17	41	Conservation	Mandibular	87	Not good	Probably faulty technique
18	45	Extraction	Infiltration	3	S.	

S. = Satisfactory; US. = Unsatisfactory.

[*Continued on p.* 344

COMMENTS ON THE ANALYSIS

It should be noted that the apparently consecutive numbering of some of these cases is of no significance, as the "unsatisfactory" cases were studied together in each batch, and later numbered in the order studied.

Cases 19 and 106 are not significant, as every operator knows the difficulty of securing a profound anæsthesia in intensely congested states, more particularly those of an actual abscess or in pulp engorgement when the opening of the pulp chamber is characterized by a pronounced extravasation of blood.

Cases 27 and 84 are indicative of the difficulty of localizing the mental foramen, particularly when one or both premolars have long since been extracted. *Case* 83 indicates another possible source of failure—namely, difficulty of approach to the selected area, sometimes due to a tense and highly strung patient, resulting in a powerful random movement of the tongue and throat musculature, and it is probable that all operators have met this type of case. Having regard to the strict criteria for "satisfactory" and "unsatisfactory" cases laid down, all these cases should clearly be placed in the "unsatisfactory" group, though it can reasonably be held that for practical purposes, *Cases* 19 and 106 are not significant, and *Cases* 83 and 84 represent errors in injection technique; however, it should be noted that *Cases* 108 and 109 were characterized by complete anæsthesia with successful conclusion of the operative procedure.

Following on this group of cases, a short series using a standard lignocaine (B.P.) type of preparation with adrenaline 1–80,000 was studied, not for the purpose of any comparative evaluation, but rather as a check on the general characteristics of this type of material. It will be noted that of 32 cases studied, 6 were

"unsatisfactory", of which 2 were probably due to faulty technique, and 1 of extraction under conditions of extreme congestion. Eleven of the cases, however, showed some "side-effect distress", 9 of no serious significance; of the 2 remaining, one showed pallor and uncertainty lasting ten minutes, and one a marked collapse calling for exhibition of the usual restorative measures; a long operative procedure was completed after the resuscitation and stimulation of the patient, who was ambulant one hour after conclusion of the operation, with no unfavourable after-effects. A cautious and critical operator could well be satisfied with such a series, though he would probably aim at the exhibition of a minimal dose commensurate with the attainment of adequately profound anæsthesia, and, indeed, it would be correct to say that this should be the aim of any operator using any anæsthetic solution under any normal set of conditions.

Case No.	*Age*	*Operation*	*Injection*	*Area*	*Result*	*Comments*
19	45	Conservation	Infiltration	$\overline{345}$	S.	
20	21	Conservation	Mental	$\overline{5}$ |	S	Full dose required
21	30	Conservation	Mandibular	$\overline{3}$ |	S.	Slow onset mandibular injection
22	35	Conservation		$\overline{57}$ |	S.	Long preparation
23	50	Extraction	Infiltration	4 |	S.	
24	35	Conservation	Infiltration	$\overline{4}$ |	S.	
25	30	Surgical extraction	Mandibular	$\overline{8}$ |	Not perfect	Marked collapse, difficulty in completing operation
26	28	Conservation	Mandibular		S.	Slight pallor, slow onset
27	49	Extraction		$\overline{7}$ |	S.	1½ cartridges. Slight pallor
28	46	Conservation and extraction	Devitalize mental	$\overline{4}$ | $\overline{5}$ |	S.	Slight pallor (to be expected) intra-osseous injection
29	18	Conservation	Multiple preparations	$\overline{76}$ | $\overline{76}$ |	S.	Some pallor. Complete recovery
30	48	Extraction	Mandibular		Not perfect	Some pallor (could operate). Tooth congested
31	30	Conservation	Mental	$\overline{5}$ |	Not perfect	Slight pallor
32	14	Conservation	Mandibular	$\overline{6}$ |	US.	Slight pallor

S.=Satisfactory; US.=Unsatisfactory.

Total 32: Satisfactory 26 (11 cases of "side-effects"); Unsatisfactory 6 (1 of marked collapse).

SUMMARY

In conclusion, the writer would stress that this work represents a short clinical study only, which may well be of help to those embarking on a more comprehensive evaluation. Apart from that, it also illustrates some of the difficulties that might be encountered in preparing such an evaluation in which both the private practitioner and research worker could profitably share.

1. A new anæsthetic is examined having a potency not demonstrably dissimilar from the lignocaine (B.P.) preparations.

2. A virtual complete absence of shock, or even minor side-effect, is noted, although this may be due to the synthetic vasoconstrictor employed. The character of "side-effect distress" is also considered.

3. Recommendation that emphasis be placed on adequate potency and complete freedom from side-effect.

4. A freedom from pain on injection or any feeling of tingling, with conveniently rapid onset and elimination, is noted.

5. Difficulty in evaluating the efficiency of an anæsthetic is discussed.

6. Consecutive cases in day-to-day private practice are analysed.

7. A short series of cases using a standard lignocaine solution is considered as a check on established clinical findings with such materials.

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CLINICAL EXAMINATION OF THE PERIODONTIUM

By **J. R. TROTT**, B.D.S., and **A. BRYAN WADE**, B.Ch.D., F.D.S. R.C.S.

Department of Periodontology, Royal Dental Hospital of London School of Dental Surgery, University of London

DURING recent years many dentists have shown a greatly increased appreciation of the importance of the supporting and investing tissues of the teeth. It is perhaps unfortunate that most periodontal diseases exhibit few symptoms in their early stages. Notwithstanding this, however, many patients also have become increasingly aware of the significance of healthy periodontal tissues. This fact is illustrated by the practice of better oral hygiene and more frequent and regular visits to the dentist.

The need for a method of clinical examination which will prevent early signs being missed is apparent. Such a method must of necessity be orderly, comprehensive, and compact, but can only be effective if the clinician has a clear impression of the signs of healthy periodontal tissues. These signs can be detected by using the visual, auditory, tactile, and olfactory senses, that is—

LOOK—LISTEN—FEEL—SMELL.

SIGNS OF HEALTH

Gingival tissue extends from a scalloped line, *the mucogingival junction*, to a free margin which bears a variable relation to the tooth, depending upon age and whether disease has existed previously. As this tissue comprises the more superficial parts of the periodontium it is, of course, primarily liable to the assaults of many of the local aetiological factors of periodontal disease. Part of the gingiva is tightly bound down to the underlying bone of the alveolar process or the cementum on the root surface, and is known as *attached gingiva*. The more marginal part has not such a firm attachment, as it forms the outer boundary of a shallow trough, *the gingival crevice*, and is referred to as *free gingiva*. In health the crevice has a uniform depth which does not exceed 2 mm. (Box, 1928), whilst the lining epithelium, *the crevicular epithelium*, has a non-keratinized surface (Goldman, 1953). This is a factor of some significance, for it is this epithelial surface which is breached in the simple inflammatory lesion which is so frequently encountered.

The colour of both free and attached gingivæ should be uniformly pink, being sharply demarcated from the red of the alveolar

Fig. 1.—Healthy gingivæ.

mucosa by the mucogingival line, except in the palate, where no change can be observed. Surface stippling of a degree finer than that found on orange peel should be present on the attached gingiva. No space should be present between the teeth, this area being filled with the pointed interdental papilla of gingival tissue, whilst the margin should taper away from the tooth at a sharp bevel (*Fig.* 1).

Tactile examination of healthy gingiva should show it to be firm, and pressure will produce blanching which disappears immediately on release of the pressure. Efforts to elicit tooth movement detectable by digital examination will prove negative. Also no pain will be produced when the teeth are percussed, but a resonant note will be emitted.

The deeper structures are the periodontal membrane, bone, and cementum, and the only visual means available to the dentist in his

surgery of examining these parts is by the use of X rays. The *periodontal membrane* can be seen as a fine radio-lucent line between the lamina dura and the cementum. Coolidge (1937) showed that the thickness of the periodontal membrane is proportional to the amount of masticatory function, and varies from one tooth to another as well as from one individual to another. It also varies in thickness at different positions on the same tooth, so that the interpretation of radiographs of this tissue must be carefully assessed.

The *lamina dura* is that portion of the alveolar process which lines the tooth socket. It appears as a thin radio-opaque line which should continue over the interdental crest. The integrity of the lamina dura can usually be determined quite easily and is of considerable diagnostic importance in periodontal lesions. The surrounding cancellous bone has a typical trabecular pattern with a strong horizontal component in the mandibular posterior region (Weinmann and Sicher, 1947). This pattern will disappear when there is decreased functional stimulation.

Cementum covers the root dentine and extends from the enamel junction around the root portion of the tooth. As new fibres of the periodontal membrane are laid down, new layers of cementum are formed for their attachment. From radiographs it is sometimes possible to differentiate between the cementum and the dentine, but usually only when some gross pathological process, such as resorption or hypercementosis is present, can any definite change be observed in the outline form of the cementum.

HISTORY TAKING

It is important when a patient presents for treatment that a history should be taken before commencing the clinical examination. The main purpose of the history is to ascertain the symptoms of the condition which is causing him to seek advice. In addition it is necessary to obtain information about any previous similar occurrence, together with past dental treatment and any relevant medical or family history. The taking of a history is not only essential for a proper evaluation of the signs and symptoms, but also affords the clinician an opportunity to assess other factors, as well as allowing the patient to gain confidence before any operative procedures are commenced. Time spent at this stage evaluating the patient and his symptoms may avoid many wasted hours later.

THE CLINICAL EXAMINATION

Visual.—This will afford an immediate assessment of the state of oral hygiene. The detailed part should commence with an examination of the gingivæ, and can be performed most satisfactorily after drying with a gauze swab. Any *colour* change should be observed and recorded. A *red* coloration will usually indicate inflammation, which, if chronic, will tend to produce a purplish hue. This cyanotic appearance is due to a lack of oxygen in the tissues and may be due to venous congestion as in the chronic inflammations or to a reduction in the number of red blood-cells and an increase in the leucocytes as in leukæmia.

Conversely the gingivæ may appear paler than normal, and if this condition is found there is cause to suspect that the patient is anæmic.

The acute and chronic inflammatory responses are the ones which most commonly cause a change in the gingival colour. Less frequently an extremely bright red margin may be observed and is pathognomonic of a streptococcal gingivitis. The red pigment contained in Gordon-Moore's dentifrice is also liable to remain on the surface of the gingivæ and might mystify the observer if he is not aware of such exogenous sources of pigmentation. Being only superficial it is, of course, removed by wiping firmly with a napkin, and this test is of value in making a differential diagnosis.

Other colours, however, are sometimes seen. *Brown*, irregular-shaped areas of pigmentation in the marginal and attached gingiva are often seen in certain races and are simulated in Addison's disease.

Heavy metals such as bismuth, arsenic, and mercury being used in the course of systemic treatment, or lead, in cases of poisoning, may

cause a line along the marginal gingiva, which varies from pale *blue* to *black*. To ascertain whether the change of colour is within the gingiva or caused by deposits of subgingival calculus showing through, a strip of paper should be placed in the gingival crevice to cover the calculus and a truer picture of the gingiva so gained.

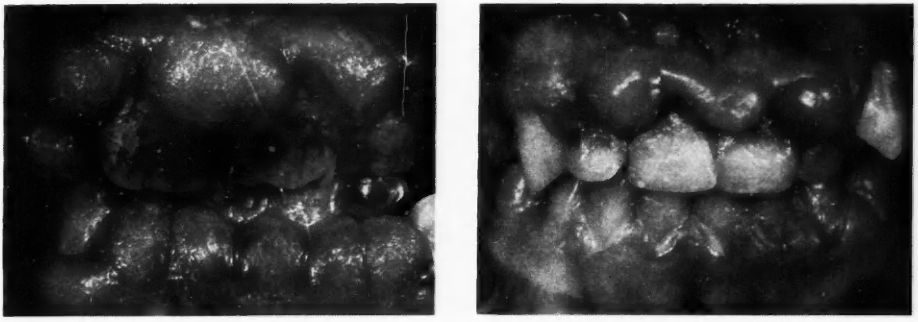
Certain dermatological diseases will also produce characteristic lesions in the gingiva. For example, fine pearly *white* lines or a red area of erosion may appear at the gingival margin in lichen planus, whereas in leucoplakia there may be a raised white irregular patch.

A diffuse *grey* appearance is found in argyria which might affect silver workers or persons being treated by silver-containing drugs, and may be accompanied by a *violet* marginal line (Glickman, 1953).

Greyish- or greenish-*yellow* margins to the gingivæ are indicative of ulceration and are usually the slough of the Vincent's type of ulcerative gingivitis.

Not only is it important to recognize the change in colour, but also its distribution. Among the acute inflammations a streptococcal infection will often spread rapidly around the entire marginal gingivæ without involving the attached part, and a Vincent's type of infection frequently starts on the tip of a papilla, causing progressive superficial necrosis from this point. If a periodontal abscess points through the attached gingiva, however, a localized area of reddening and swelling is produced. The red of chronic inflammatory reactions may be localized to an area of food impaction and stagnation, or generalized due to subgingival calculus, and may involve any part of the gingiva, marginal, papillary, or attached, depending on the aetiology and severity.

Colour characteristics can also assist greatly in differentiating the various tumours found on the gingiva. Those in which fibrous tissue predominates are pink or red no matter whether they are hyperplastic or neoplastic, yet when osteoclasts are present in abundance the colour is more purplish. A papilloma is pale or even white, in contradistinction to the tumours found in pregnancy, which are raspberry-red, as is the generalized gingival lesion which is sometimes associated with this state.



A B

Fig. 2.—A, Generalized papillary enlargement of firm texture, coarse stippling, and interpapillary clefts in epanutin hyperplasia. B, Enlargement of softer texture with loss of stippling affecting the entire marginal gingivæ, but localized to the labial aspect of the maxillary anterior region associated with faulty lip posture.

Detection of any colour change should be followed by an examination of the *contour* of the gingivæ. Variations in contour or position of the gingiva can either be local or general, and may involve the margin of the gingiva, including the interdental papilla, or just the papilla. These changes in position and contour may be enlargement, recession, or ulceration.

Enlargement of the gingiva can be due to many factors and it is particularly important

to notice where the enlargement is situated, whether it is limited to the marginal gingivæ or the papillæ, or if both are involved. The consistency and surface characteristics must also be observed. In epanutin hyperplasia (*Fig.* 2, A) the interdental papillæ appear to have enlarged and encroached upon the interpapillary regions, for clefts are present between the papillæ, whereas, in hyperplasia associated with a faulty lip posture (*Fig.* 2, B) both the papillæ and the interpapillary areas have enlarged. Also the enlargement in the latter case is confined to the anterior regions, being most severe on the labial aspect in the maxilla.

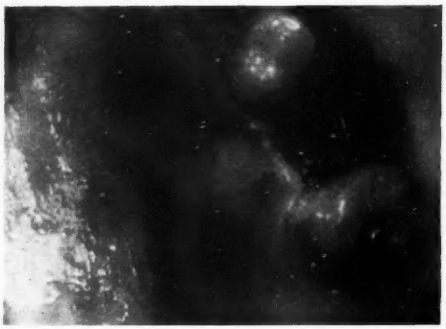


Fig. 3.—Ruptured vesicles formed as an allergic response to procaine hydrochloride.

Gingival enlargement, which is generalized, tends to be due to, or conditioned by, a systemic factor. Thus, the changes of hormonal origin found at puberty, as well as those of genetic origin and associated with the drug epanutin, are not often limited to one area of the mouth, though they may be occasionally as in a pregnancy tumour. Localized enlargement usually denotes either an abscess, a neoplasm, or hyperplasia of inflammatory origin. Very occasionally one or more vesicles will be observed in the preulcerative phase of a herpetic lesion, in the bullous form of lichen planus, in pemphigus, or as an allergic response (*Fig.* 3).

Not only is it necessary to differentiate between the more gross gingival enlargements, but also between those of less magnitude, though probably greater significance, which are found in the simple inflammatory lesion of chronic gingivitis. Here tactile examination is of major significance as will be explained later.

Recession of the gingiva must be carefully assessed, for such recession signifies that more than gingival tissue has been lost and that some of the bony support has gone. The distribution of this recession may give a guide to the aetiology. As with gingival enlargement, periodontal recession which is generalized usually indicates a systemic aetiology,

Fig. 4.—Different stages of papillary destruction pathognomonic of ulcerative gingivitis of the Vincent's type.

and so there are the conditions of senile and pre-senile atrophy. Where the recession is localized it is imperative that the exact distribution should be noted. When it is uniform around all aspects of the tooth there is a strong indication that disuse is the aetiological factor, whereas if confined to one aspect only there is probably impaired function, which might be excessive or insufficient.

Recession on the vestibular aspect only, and associated with abrasion of the teeth, is suggestive of faulty brushing and is usually most pronounced in the maxillary canine region on the side opposite to the hand used to hold the brush. The periodontal tissues might also recede owing to heavy deposits of supragingival calculus, in which case the recession will be most pronounced in the areas of calculus deposition. Sometimes recession is associated with the destructive lesions of chronic periodontitis, but usually pockets are formed in this condition.

Ulceration of the gingiva is most commonly found in the Vincent's type of gingivitis, where the saucer-shaped destruction of the interdental papillæ is pathognomonic (*Fig.* 4). These ulcers are marginal and only rarely found on the attached gingiva. Ulceration of the attached gingiva is normally of traumatic origin or of the aphthous type. Although similar in appearance, these ulcers have two characteristics which help in differentiation. Aphthous ulcers are rarely found singly and are exquisitely painful, whereas traumatic are single and not nearly so painful, and a history of recurrence, so typical of the aphthous lesions, is absent. Only very rarely will an ulcer of any other kind be found on the gingiva, but any which persist for more than a fortnight in spite of the institution of apparently suitable treatment should be biopsied.

Surface stippling coarser than normal is found in the gingival lesion associated with epanutin therapy (*Fig.* 2, A), whereas a loss of stippling is one of the first signs of simple inflammation. In certain hormonal disturbances, notably the post-menopausal period, a desquamative gingivosis is sometimes seen (*Fig.* 5, A). The surface of the attached gingiva is lost, leaving irregular blotchy red, raw areas. If the surface of apparently sound epithelium is wiped with a gauze swab the superficial layers of epithelium are removed and tissue fluid exudes. Raw areas are also found in the erosive form of lichen planus (*Fig.* 5, B), but exudation from these is not normally detected.

It should be noted whether or not the patient is wearing either an *orthodontic appliance* or any kind of *partial dentures*. The type of orthodontic appliance and the frequency with which it is used is important with regard to the effect on the periodontium. Similarly with partial dentures, the design, construction, and length of time worn is significant. The health of the periodontal tissues of the abutment teeth should be carefully analysed as one continues with the examination, and functional movement of the jaws should be investigated with the dentures both in and out of the mouth.

A B

Fig. 5.—A, Blotchy appearance of the gingivæ in the maxilla associated with hormonal disturbance. B, Similar appearance found in the erosive form of lichen planus.

At this stage an examination of the *occlusion* is appropriate. It is most important to realize that an examination of a static closed position is not enough, and that the two jaws should be examined in function. This can be made easier if certain recognized positions and movements are known. First of all observe the position of rest. Ask the patient to suck, swallow, and relax, or say "m", and then without allowing any movement by the patient part the lips and note the space between the teeth. Usually it is 3–4 mm. and is known as the "free-way space". Then ask the patient to close slowly from there until the teeth contact, and notice if in the last few millimetres of movement there is any deviation of

the mandible after the initial contact. Such a deviation is indicative of a premature contact. Notice also if there is abnormal movement of any teeth as they come together. The lateral excursions can then be studied by asking the patient to grind the teeth slowly from side to side. If there is any lack of balance, it may be possible to see which teeth are causing interference and which are bearing an excessive strain. Facets on some teeth may assist in showing where this interference is taking place. Lastly ask the patient to slide the lower jaw forwards until the front teeth are edge-to-edge and notice the degree of balance that occurs in this movement. On occasion it will be possible to observe movement of the teeth during these excursions, and this may be particularly apparent if a finger is placed against the affected teeth. As will be explained later, the visual examination of the occlusion should be accompanied by a tactile examination, using the pulpal aspects of one's fingers to detect movement.

Auditory.—Before a combined visual and tactile examination is made with a mirror and probe, the auditory sense should be used. When watching the patient close into centric *occlusion* it is sometimes possible to hear the premature contact as a slight click, whilst in lateral and protrusive excursions a disharmony may produce a most unpleasant grating noise as one or two teeth take the burden.

Percussion of the teeth might also assist in the diagnosis of a periodontal lesion. Where there is loss of supporting bone the note emitted is less resonant, whilst a dead pulp, which is so frequently associated with a periapical lesion, will cause the tooth to sound dull when percussed. Not only is the actual note produced on percussion of diagnostic significance, but a reaction by the patient denotes an acute periodontitis.

Tactile.—The tactile examination should be commenced with palpation. The attached gingiva is usually firm and immovable but pathological processes will alter the *consistency*. A periodontal abscess may cause a fluctuating swelling, while inflammatory œdema will show pitting on pressure. If the gingiva is pressed with a blunt pocket probe pitting can be produced which will normally disappear rapidly, but if œdema is present the pit will remain for some minutes.

On the other hand, firm tissue will blanch on pressure, only to return to normal coloration and form almost immediately the pressure is released. It must be appreciated, however, that all firm tissue is not healthy tissue. Gingival enlargement which does not produce a positive response to the pitting test can only be eliminated by surgical excision, but enlargement due to œdema will go when the source of irritation is removed.

Gentle pressure at the gingival margin may produce some *discharge* from a deep pocket, and this should be investigated. Similarly pressure in the buccal sulcus may elicit a response of pain or a discharge from a sinus.

The *mobility* of the teeth should be examined by either using two fingers or one finger and an instrument. Unless done in this way, a false impression may be gained. Teeth exhibit slight mobility normally, but this cannot be detected by digital examination. Abnormal mobility can be graded as slight, moderate, or excessive. Testing is usually carried out in a buccolingual direction, but teeth can also show mobility in a vertical direction if there is very extensive periodontal involvement. By laying a finger along the buccal surfaces of the teeth and asking the patient to close into occlusion, a premature contact on a tooth may be felt. Similarly when lateral excursions are carried out, excessive strain on a tooth can be detected. This tactile examination will often reveal mobility which was not observed during the visual examination.

Using a mirror and probe the teeth and gingivæ should be carefully examined. Previous *restorations* should be checked for contour, contact, marginal finish, and polish (Romine, 1952). The ridges and fossæ in occlusal restorations are just as essential to the health of the periodontium as the proximal contour and contact. Margins of restorations should be checked for any overhanging edge or deficiency which may cause irritation to the gingiva, either mechanically or by encouraging food stagnation.

Examination of the gingival crevice should start with the search for *calculus*. Supragingival calculus is visible and can be felt with an ordinary probe, but subgingival calculus is best located with a Briault probe. The probe should be held lightly with the pointed end parallel to the tooth surface. It should be inserted into the gingival crevice as far as its base, and then, with the hooked end lying against the tooth and along the base of the crevice or pocket, a withdrawal should be attempted. It is in this coronal movement that the subgingival calculus is best detected, although it can be felt when the probe is being passed into the pocket if it is kept closely applied to the cementum. Calculus will be felt as an excrescence on the root surface whilst caries or areas of decalcification will be detected as cavitation in the tooth. It is essential that the gingival crevice around each tooth should be carefully examined, remembering that subgingival calculus has a more generalized distribution than supragingival calculus.

Fig. 6.—Correct insertion of a pocket-measuring probe.

Following the location and distribution of calculus, the depths and types of *pockets* should be determined. Pockets may be either true or false, depending on whether or not there has been destruction of the supporting tissues and apical proliferation of the epithelial attachment. If there has been destruction then it is a true pocket, and if the base of the pocket is apical to the alveolar crest it is said to be intra-bony. If there is no destruction and no detachment, as is indicated by the presence of an interdental space, then the pocket is false. Such a pocket is, of course, formed as the result of gingival enlargement. However, clinically it is often found that a pocket has been formed by both methods and, therefore, can be called a combined one. In planning treatment it is important to ascertain the extent and type of pocketing, or the degree of true and false pocketing present in a combined pocket. For this purpose a flattened pocket-measuring probe, rounded at the end and with 2-mm. graduations, is recommended. The probe should be passed into the gingival crevice in the long axis of the tooth (*Fig.* 6), because if inserted at an angle a false depth will be recorded. All crevices should be examined with this probe on each proximal aspect of every tooth, both lingually and vestibularly, thus obtaining four measurements per tooth. It will rarely be necessary to measure the interpapillary region, as pockets are not often found at this site. Should a deep pocket be found on one aspect of a tooth only (*Fig.* 7), it indicates that the condition is other than a simple periodontitis. Such strictly localized pockets are found in the degenerative lesion known as periodontosis, as the result of occlusal trauma, or when a parodontal abscess has pointed in the gingival crevice or in an already existing pocket.

Fig. 7.—A deep pocket in the interpapillary region and confined to this area.

Olfactory.—It is rare in dental practice to use the olfactory sense, yet in the diagnosis

of ulcerative gingivitis of the Vincent's type it is of great assistance. The fœtid odour that is present is quite unmistakable, and correlated with other clinical findings helps in the final diagnosis. Pus, which might be removed by a probe from deep pockets or a periodontal abscess, also has a characteristic odour, and where the pocketing is generalized will produce a definite halitosis.

ADDITIONAL INVESTIGATIONS

Having completed the clinical examination and made a diagnosis, a treatment plan can be evolved. For certain patients it may be considered necessary to carry out some special examinations before a final diagnosis can be made. These additional investigations may also assist in making a prognosis. Study models are useful adjuncts to the oral examination, for from them the implications of inclined, malposed, and over-erupted teeth, as well as the form and structure of each arch with its occlusal relationship, can be appreciated more readily. Sometimes it may be advisable to carry out a complete bite analysis on an adjustable articulator (Grewcock, 1951) to ascertain the exact point of any premature contact. Articulated models can also be trimmed to reproduce the effects of selective grinding and will help to assess the probable value of this type of treatment. In conjunction with study models, full-mouth radiographs will provide further information about the state of the patient's periodontium. Occasionally it will be necessary to obtain blood for hæmatological examinations, a biopsy specimen for pathological examination, or to make a smear or inoculation for bacteriological purposes.

SUMMARY

Stress has been laid on the fact that not until a history has been taken, and a thorough clinical examination performed, can a diagnosis be made and a logical treatment evolved.

Signs of health in the periodontal tissues have been described.

A methodical examination of the periodontium has been outlined. The examination should be visual, auditory, tactile, and olfactory.

Relations between clinical findings and differential diagnosis have been shown.

The value and scope of certain additional investigations has been mentioned briefly.

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A METHOD OF RECORDING MASTICATORY LOADS

A National Physical Laboratory standard strain gauge was used consisting of a coil of fine wire wound on to tissue paper impregnated with phenolic resin compressed to a flat rectangular sheet. Within appropriate limits the resistance changes (measured with a Wheatstone bridge) are proportional to dimensional change. The use of a D.C. amplifier and cathode ray tube permitted continuous recording. The bar carrying the gauge was set into a cavity in an inlay with the ends unrestrained, and covered by a second inlay designed to leave the centre of the gauge exposed to masticatory forces.—Anderson, D. J. (1953), *J. Dent. Res.*, **32**, 785.

SIMPLIFIED BITE REGISTRATION

By **JOHN SEEAR**, L.D.S. R.C.S.

FOR some time now I have been experimenting with T bite blocks, and have found these extremely useful in a busy practice. As with most people in our profession, talk with colleagues invariably turns to "shop", and, much to my surprise, very few dental surgeons seem to have heard of this very simple yet extremely effective and efficient method of "taking a bite". Doubtless the pundits will raise their hands in horror and the teaching schools look askance, but it is nevertheless thought worthwhile to pass on this most useful technique.

The "bite block" is a prefabricated one made in the form of a T and will give a three-point contact with the upper and lower ridges of sufficient area to ensure accurate positioning on the models. Centre line and high and normal lip lines can be marked, or if required the centrals can be waxed on. The bite is taken at the same appointment as the impressions and can be used as the final registration, or used as an accurate guide by the technician when "compo" or plaster-pumice rims are

Fig. 1.—Views of a T block before and after use.

Fig. 2.—T bite block being positioned under the tongue.

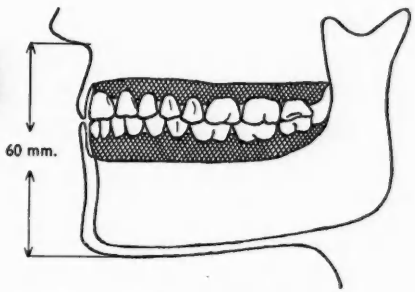


Fig. 3.—Diagram showing normal occlusion and measurement.

required, as the models can be mounted on the articulator in the correct "closed" position and the bite blocks built up on these models to the desired height and correct occlusal plane, thus leaving only the final adjustments to be made in the mouth.

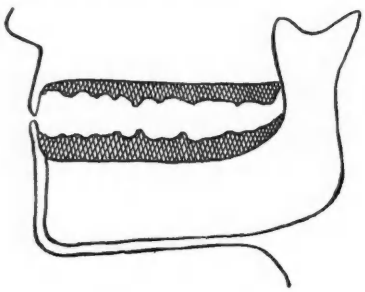


Fig. 4.—All teeth removed.

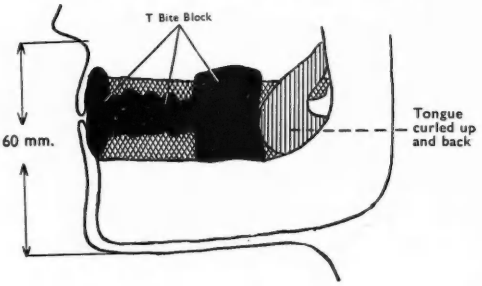


Fig. 5.—T bite block in position with jaws in original relationship.

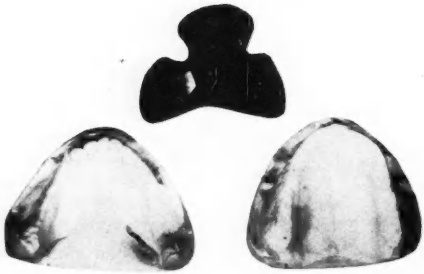


Fig. 6.—F/P models and T block.

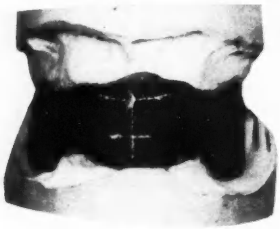


Fig. 7.—F/P models positioned on T bite block.

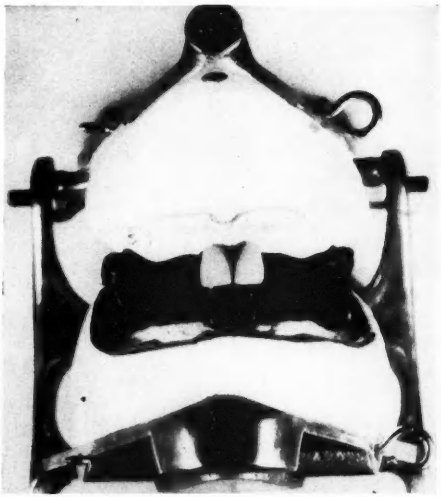


Fig. 8.—The two centrals fitted on T block when bite taken, and the models fixed on articulator.

METHOD OF USE

Whilst the impressions are being taken the wax T block is placed in a bowl of hot water at around 50° C. and left to soften for about 10 minutes. When ready the block is inserted in the mouth with the crossbar of the T going under the tongue and its ends resting on the ridges in the 4, 5, 6 areas. The patient is instructed to curl the tongue up and back in an endeavour to touch the back of the throat with its tip. The patient is now instructed SLOWLY to close until the degree of closure is considered correct. (This position is frequently first measured with a bite gauge, using pencil marks on the lip under the nose and on the point of the chin.)

When the patient has closed the required distance, those portions of the bite block

which overlap the ridges are moulded into the sulci and adapted as closely as possible against the ridges. The centre line, high and normal lip lines, are marked on the wax, or if desired the centrals may be waxed on.

This technique of bite taking can be used in exactly the same way for partial, edentulous, and "mixed" mouths.

Occasionally the patient tends to close too quickly and too far before the operator can prevent it, and here it is only necessary to remove the block, add strips of wax on one surface of the block, re-position, and obtain the correct depth of bite. If the block is obviously too thick for a particular case, it can speedily be reduced by slicing a portion off when softened, the piece which has been removed often coming in useful later.

I should greatly appreciate hearing from colleagues who either use this technique already

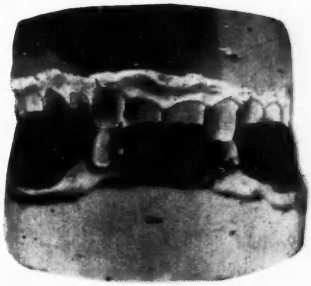


Fig. 9.—T bite block used in –/P case.

or who try it out as a result of this article, and would welcome all viewpoints.

NOTES ON DENTAL RADIOGRAPHY

IV. SPECIAL DENTAL RADIOGRAPHICAL EXAMINATIONS

By **G. R. SEWARD**, M.D.S. (Lond.), F.D.S. R.C.S. (Eng.)

Demonstrator in Dental Radiology, The London Hospital Dental School

(*Continued from page* 319)

A GOOD deal of extra information about a case can be obtained from radiographs if the views utilized are carefully selected. For simple lesions one film, often a periapical film, will provide all the information desired. More extensive or more complex lesions or those requiring surgical interference may necessitate the taking of several views, but each of these views should be designed to provide some additional piece of information. A large number of views indiscriminately chosen will only waste time and material and subject the patient to needless radiation.

Several examinations are considered in this paper. The views which can be taken for each subject will be mentioned and their uses indicated so that a suitable selection may be made. Lesions of the mandible will be considered first, followed by those of the maxilla, and will include impacted teeth, cysts, fractures of the mandible, and roots in the antrum.

THE MANDIBLE

1. The Mandibular Third Molar.—Periapical, occlusal, and oblique lateral jaw views can be taken of these teeth, and the indications for each will be considered:

a. The Periapical View (*Fig.* 1 A).—The film can be positioned nearly parallel to the long axis of the tooth, the central ray is almost perpendicular to both tooth and film, and the object–film distance is small. These factors combine to produce a sharp image with minimum distortion so that this view should be taken wherever possible. Even in difficult cases a good picture can often be obtained with patience. The requirements of a periapical view of a lower third molar which is to be removed are:—

i. A sharp, undistorted image of the tooth;

ii. A picture of the bone behind the tooth, below its apex and above the crown if deeply seated;

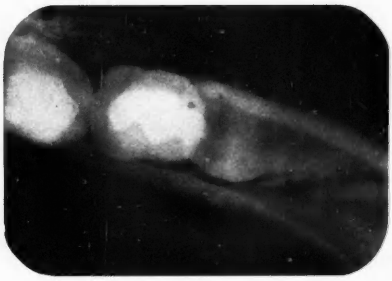
iii. A clear view of the contact point of the third molar with the second molar and of the space below it;

iv. A view of the second molar with the buccal and lingual cusps superimposed.

The periapical examination should also include the first molar, for which a separate film may be needed, as in some cases the need for the extraction of the first molar will modify the decision to extract the third.

If an adequate amount of bone distal to and below the third molar is shown on the film it should be possible to detect the presence of other lesions, such as cysts, in relationship to the tooth.

A



B

Fig. 1.—A, A periapical view of a horizontal lower third molar meeting the requirements set out in the text. B, An occlusal view of the same tooth. An oblique lateral jaw view of this patient is to be seen in *Fig.* 2 B of Part III, p. 314.

b. The Occlusal View (*Fig.* 1 B).—The indications for this view are as follows:—

i. To complete two views at right angles required to localize the buried "foreign body" when the tooth is completely unerupted;

ii. To provide a lateral view of a bucco-lingually placed, horizontal tooth so that its root form may be seen and so that the position of the crown may be ascertained;

iii. To ensure that the amount of bone buccally and lingually may be seen in a badly displaced tooth, even if its position can be seen clinically. This applies mainly to buccally placed teeth.

The Oblique Lateral Jaw View.—The obliquity of projection necessary for this view produces a degree of distortion which is often overlooked. For instance, a lingually inclined lower third molar will appear more vertical in this view, and the apparent relationship of tooth and inferior dental canal may be markedly altered. Unless an increased anode–film distance is used, marked enlargement may follow from the increased object–film distance. If, as is common practice, a cassette with screen-sensitive film is used, a loss of detail compared with a periapical film must be expected.

The oblique lateral jaw view is indicated when:—

i. Inability to open the jaws prevents the introduction of a periapical film;

ii. The position of the tooth is such that a satisfactory view cannot be obtained on a periapical film.

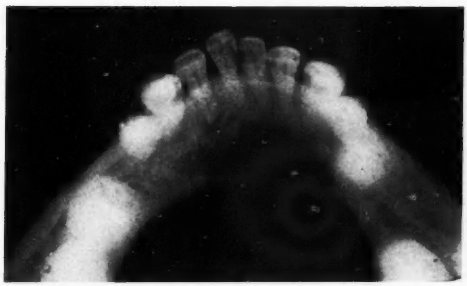
iii. The third molar is associated with a large lesion—cyst, fracture, osteomyelitis, or the like—which cannot be contained on the smaller film.

iv. The relationship of the upper third molar to the lower is desired and cannot be seen clinically.

v. An extensive surgical procedure is necessary for the removal of the tooth and an indication of the size and structure of the mandible in the region is desired.

2. Mandibular Cysts (*Fig.* 2).—The uses of periapical, occlusal, oblique lateral jaw, rotated P.A., and P.A. jaws views are obvious. Tangential views are less often taken, but these can provide useful information about the strength of the jaw and the relationship of the lesion to the roots of standing teeth. In the lower incisor region a tangential view is taken

by placing an occlusal film packet upright against the side of the chin. The central ray is directed at the cyst at right angles to the sagittal plane. For the molar region a cassette is used, being placed at right angles to a central ray directed tangentially to the mandible.



A

B

Fig. 2.—**A**, A central true occlusal of the lower jaw showing a radicular cyst in the lower incisor region. **B**, A tangential view shows the distribution of bone around the cyst and the relationship of the lower incisors. The operation required to deal with this cyst is obvious.

3. Radiography of the Fractured Mandible.—As it is often necessary to again X-ray the fracture sites subsequent to reduction, care should be exercised at the initial examination not to take a large number of unnecessary films. It is desirable not to exceed half the erythema dose for the area under examination at any one time, and not to subject the patient to further radiations for at least fourteen days following such a dose. It is suggested therefore that the initial examination should not exceed half this amount, or one-quarter the erythema dose for the area involved. With this end in view, the initial radiographical examination should be delayed if possible until the services of a radiographer experienced in this type of work can be obtained. Occasionally a case has to be re-examined at intervals over a considerable period of time. Such re-examinations should involve the minimum of radiation as it is inadvisable to repeat an extensive radiographical examination of a patient, even with fourteen-day intervals on more than a few occasions.

The initial examination should proceed as follows:—

a. X-ray the clinical sites of fracture with two views at right angles. In some places three views at right angles are possible.

b. X-ray the points of possible indirect fracture in a similar manner.

c. Review the films taken and take such further views as are necessary to cover any un-examined part of the mandible in one plane.

Fractures considered by Regions.—

a. From canine to canine:

Take:—

1. A rotated P.A. or 45° occlusal.
2. A true occlusal.
3. A periapical view of the teeth involved if possible.

b. The body of the mandible:

Take:—

1. An oblique lateral jaw of the region fractured.
2. A P.A. jaws view.
3. An occlusal—central ray directed along the fracture line.
4. A periapical view of the tooth in the line of fracture if possible.

c. The ramus:
Take:—

1. An oblique lateral jaw of the angle if the fracture is low, or of the ramus if it is high.
2. A P.A. jaws view.
3. A view taken on a periapical film placed as for the occlusal of a lower third molar but with the central ray directed along the fracture line if the fracture runs through the angle.

d. Subcondylar and condylar fractures:
Take:—

1. A McQueen-Dell or an oblique lateral jaw view.
2. A P.A. jaws view.

Example Examination:—
Take:—

a. A rotated P.A., true occlusal, and periapical view of $\overline{|23}$ region. Clinical site of fracture of $\overline{|23}$ region.

b. A P.A. jaws and a McQueen-Dell of the right neck of condyle for a suspected indirect fracture of right neck of condyle.

c. Oblique lateral jaws of the right and left third molar regions to complete effective coverage of the jaw.

Stretcher Cases.—Films of fractured jaws can be taken without great difficulty even when it is undesirable to disturb a patient on a stretcher. For oblique lateral jaw and rotated P.A. jaws views remove the pillow so that the head can be extended backwards on the spine. A cassette is supported by sandbags against the side of the jaw and the head rotated sideways until the affected region of the jaw lies against it. The angulation of the rays usually obtained by means of the angle board may now be achieved by horizontal angulation of the tube head.

The highly manœuvrable head of a dental set enables occlusal and periapical films to be taken provided the angles are judged by eye. Finally an A.P. jaws can be substituted for a P.A. jaws.

THE MAXILLA

1. The Upper Third Molar.—

a. Periapical Views.—These give good detail and indicate the relationship of the third to the second molar. If the tooth is low down this view alone is adequate, unless the tooth is horizontal and lies buccolingually. If the tooth is high the increased vertical angle makes the resultant image approach that of an occlusal view.

b. The Oblique Lateral Jaw View.—An oblique lateral jaw view, taken in a similar manner to that for a lower third molar, will provide a better lateral projection of these high wisdom teeth than can be obtained with intra-oral films.

Fig. 3.—A periapical view of $\underline{|2}$, showing resorption of its root by the buried $\underline{|3}$.

c. The Occlusal View of the Upper Third Molar.—This is necessary to decide the position of the crown of buccolingual, horizontal, upper third molars. It is also indicated to show whether a retained root is buccal or palatal.

d. Lateral Sinuses and P.A. Jaws Views.—Where the tooth is grossly displaced, for example just below the orbit, the lateral sinuses and P.A. jaws views give a more accurate indication of its height from the occlusal plane and its relationships in the coronal plane.

2. The Buried Upper Canine.—Two types of views have to be considered for this problem.

Firstly, views which show details of the shape of the tooth, especially the curvatures of its root and details of related teeth for the possibility of their being resorbed (*Figs* 3, 4). Secondly, views are required to demonstrate the true position of the canine in relationship to surrounding teeth and structures.

Fig. 4.—A periapical view of a buried upper canine giving little indication of the difficulty of its removal. *Figs.* 4–7 are of the same patient.

Fig. 5.—A vertex occlusal shows the canine (outlined by dotted line) to be in very close relationship to $\underline{|12}$.

a. Structure Detail.—A standard true occlusal view should be taken first. This will enable a film to be placed intelligently for a periapical view. These two views will give good detailed pictures of the tooth and surrounding structures, but must not be used to indicate the relationships of these structures. For example, a high, labially placed canine may appear to be in the palate in a standard true occlusal view.

b. Localization Views.—If a further periapical film is taken after moving the tube horizontally a short distance from the normal position the relationship of the canine to the arch may be determined by parallax (*see* p. 213). A more direct method of telling whether the canine is buccal to the arch or in the palate is by taking a vertex occlusal (*Fig.* 5).

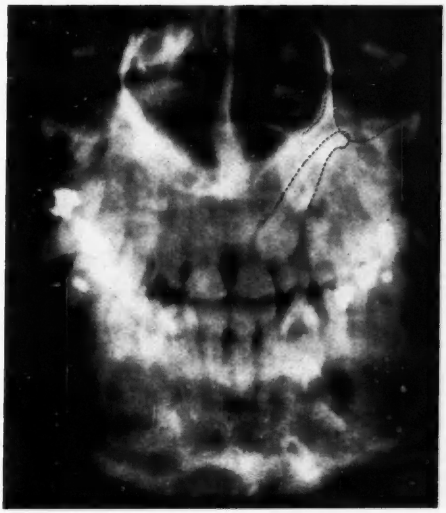


Fig. 6.—Print of the central part of a P.A. jaws view. The root of $\underline{|3}$, the antrum, and nasal cavity are outlined by the dotted lines. This view shows the relationship of $\underline{|3}$ apex to the nasal wall of the antrum and also the hook on the root, not seen in the periapical film, as it lay in the plane of the rays.

Periapical films do not show the true inclination of the long axis of the canine. A P.A. jaws and a lateral sinuses view of the side under consideration will indicate the true inclination of the long axis of the tooth, its height above the occlusal plane, and its relationship to the antrum and nasal cavity (*Figs.* 6, 7).

3. Maxillary Cysts.—Periapical and topographical views show the relationship of the lesion to the standing teeth and the alveolus.

The standard true occlusal enables one side of the maxilla to be compared with the other; expansion of the buccal plate, destruction of the palate, and involvement of the antrum or nose may also be detected. If buccal expansion is extensive a lateral true occlusal is indicated.

Fig. 7.—A lateral sinuses view. The roots of $\underline{|345}$, the antrum, and floor of nose outlined. Note the relationship of the apex of $\underline{|3}$ to the two latter structures and its height above the premolar apices. If this tooth is to be removed the operator may need to amputate the apex, and this information will be required.

Where involvement of the antrum has occurred the differentiation of antrum from cyst may have to be made. Sinus views will help in this matter, and of these the lateral sinuses view is the most useful, closely followed by the occipito-mental. A small cyst towards the back of the antrum will often not be seen in an occipito-mental view, but an oblique facial bones or P.A. jaws view may help in these cases. Where the cyst completely fills the antrum and bulges into the nose, aspiration of part of its contents will enable a fluid level to be seen in an occipito-mental view helping to determine its extent.

It is interesting to note that a cyst bulging into the antrum may disappear in stereoscopic radiographs. In plane films the rays travelling tangentially to the surface of the cyst pass edgewise through its bony wall and throw a white line on the film. In stereoscopic radiographs the cyst is seen in three dimensions and the bone may no longer "throw" a visible shadow.

4. Root in the Antrum.—The localization of a root believed to have been displaced into the antrum can be a difficult procedure. If the root has only just been lost it will probably lie near the socket. If several days have passed and it is completely within the cavity the root may be raised up on the thickened, inflamed mucosa.

An effort should be made first to identify the shape of the root in a view giving maximum definition and minimum distortion. The examination should be made with minimum delay as if bleeding into the antrum occurs the grey shadow of the blood will make interpretation difficult.

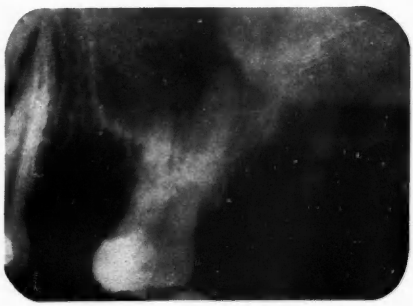


Fig. 8.—A root was displaced into the antrum from $\underline{|7}$ socket some days previously. A periapical view shows the empty socket but fails to show the root. Note the "cloudiness" of the antrum due to thickened mucosa.

Firstly take a periapical view showing the empty socket and the related part of the antrum (*Fig.* 8). Le Masters' technique may be necessary to get rid of the malar shadow.

A topographical X-ray should also be taken. It should be noted that an increased anode–film distance should be used, as the root will lie a good way from the film. If normal cone distance is used the shadow of the root may be grossly enlarged, distorted, and escape notice.

If the root is seen in the periapical view a lateral true occlusal will probably complete the localization. If the root is only seen in the topographical X-ray, or is not seen in either periapical or topographical view, a lateral sinuses view of the side concerned should be taken.

A root raised high in the antrum by the thickened mucosa will be clearly seen by this method (*Fig.* 9). The lateral sinuses view also gives the true height of the tooth above the alveolus, which may help if there is some possibility of the root being in the soft tissues palatal to the socket. Such a root might appear to be in the antrum in a periapical or topographical view.

If the lateral sinuses view shows the root, an attempt should be made to show it in a view at right angles, so proving its presence in the antrum.

When the root is high in the antrum or near the anterior end it may be identified in an occipito-mental view. This view will also demonstrate the thickened mucosa. Blood in the antrum will also be seen in this view and if present will obscure the root. If the root is low and posterior a lateral true occlusal, or an occipital frontal view may be tried.

Acknowledgements.—My thanks are due to Mr. G. T. Hankey, Consultant Dental Surgeon to the London Hospital and Lecturer in Dental Radiology, and to Mr. N. Livingstone Ward, Consultant Dental Surgeon to the London Hospital, for their kind advice, criticism, and revision of these notes.

Fig. 9.—A lateral sinuses view of the same case as *Fig.* 8 showed the root high above $\underline{6}$. An occipito-mental view showed the thickened mucosa, and an occlusal view taken as for an upper third molar completed the localization of the root in the antrum.

EXTERNAL EXTENSION APPARATUS OF PARTIALLY NEW CONSTRUCTION

THE author describes a simple modification of the method described by Kelsey Fry and others for an extra-oral fixation system.

A plaster headcap is fitted in the normal way with a horn on either side in the temporal region, while an "eye" is fitted about 3 in. posteriorly to each of these. A fairly stout rod about 2 ft. long is then bent into a U, the arms of which are the same distance apart as the "eyes". The ends of the arms are then passed through the "eyes" in a ventro-dorsal direction, while the anterior portion is bent down over the "horns" so that the base of the U lies just in front of the chin. The arms are fixed to the "horns" with clamps. This gives a simple and stable anchorage for pins, splints, etc.

Modified clamps, sockets, and localizing plates are also described and illustrated.—HILLERSTRÖM, K. (1953), *Svensk tandläk. Tidskr.*, **46**, No. 5, 343.

THE PROCEEDINGS OF THE BRITISH SOCIETY OF PERIODONTOLOGY

President: A. Frank Stammers, M.D.S.

Hon. Secretary: H. Thomson, L.D.S. R.F.P.S. Glasg., H.D.D. R.C.S. Edin.
53, Portland Place, London, W.1.

Vol. IV, No. 7 July, 1954

ANNUAL CLINICAL MEETING

The Annual Clinical Meeting of the Society was held on Friday, April 9, 1954, at the Eastman Dental Hospital in London.

Cases of Clinical Interest.—For the first time in the history of the Society patients exhibiting periodontal lesions or forms of treatment were presented by members. Among the patients attending were examples of periodontal traumatism; a lateral periodontal abscess in association with a tooth in an active phase of eruption; treatment by the flap operation; immobilization by removeable splints; and an implant denture as a method of solving the problem of the free-end saddle. Those presenting the cases were C. G. G. Clarke, L.D.S. R.C.S.; W. G. Cross, M.S., M.B., B.D.S.; R. D. Emslie, M.S., B.D.S., F.D.S. R.C.S.; C. A. O'Sullivan, B.D.S.; E. McK. Sycamore, M.R.C.S., L.R.C.P., L.D.S. R.C.S.; and A. Bryan Wade, B.Ch.D., F.D.S. R.C.S.

Table Demonstrations.—

The Use of Study Models in Periodontal Practice, by W. A. S. Alldritt, B.D.S., F.D.S. R.C.S. The value of accurately produced models as an aid to teaching as well as assisting in diagnosis and recording the progress of treatment.

The Diagnosis of Acute Herpetic Gingivostomatitis, by E. Desmond Farmer, M.D.S., B.A., F.D.S. R.C.S. A demonstration of photomicrographs showing how examination of biopsies can assist in establishing a diagnosis.

Six Cases of Clinical Interest illustrated by Photographs, by Egon C. Fox, M.D., L.D.S. R.C.S. Colour transparencies showing patients treated in the Birmingham School of Dental Surgery.

Temporomandibular Joint Radiography, by R. J. G. Grewcock, L.D.S. R.C.S. A method of producing radiographs of the temporomandibular joint, using a small dental X-ray machine.

Some Unusual Histological Appearances of Lesions of the Oral Mucosæ, by J. A. Pedler, M.D.S., F.D.S. R.C.S., M.R.C.S., L.R.C.P. A series of photomicrographs showing unusual conditions, including an ectopic tonsil in the cheek.

ANNUAL GENERAL MEETING

The Annual General Meeting was also held on Friday, April 9, at which the Council for the 1954–5 session was elected.

President: F. E. Hopper, B.D.S., F.D.S. R.C.S.; *President-elect*: W. G. Cross, M.S., M.B., B.D.S.; *Hon. Secretary*: A. Bryan Wade, B.Ch.D., F.D.S. R.C.S.; *Hon. Treasurer*: G. A. Cuthbertson, H.D.D. R.C.S., L.D.S. R.F.P.S.; *Hon. Librarian*: E. C. Fox, D.M.D., L.D.S. R.C.S.; *Full Members*: R. D. Emslie, M.S., B.D.S., F.D.S. R.C.S.; E. D. Farmer, M.D.S., B.A., F.D.S. R.C.S.; *Associate Member*: H. Colin Davis, L.D.S. R.C.S.

SCOTTISH DENTAL ESTIMATES BOARD

Please note that as from June 19, 1954, the Board's offices are removing to: Broomhouse Drive, Saughton, Edinburgh, 11. (Tel. No.: CRAiglockhart 4040, Ext. 220.)

REMOVAL OF NAME

The name of C. A. W. Fielding, of 12 Derwent View, Burnopfield, Co. Durham, has been ordered to be removed from any dental list in which it is now included. The name may not be included in future in any dental list unless the Tribunal or the Minister so directs.

Occlusal Changes in the Adult Dentition

This study (a serial investigation over a period of eight to twelve years) covers forty-four adult dentitions, the ages of the subjects ranging from 23 to 36 years at the start of the study. Cases were chosen with complete dentitions and who had only received minor

ABSTRACTS
from Other Journals

conservative treatment. As a supplement to the study some cases with missing units and prosthetic restorations are described.

Each case was examined at intervals of two to three years over a period of eight to twelve years. At each examination a bite analysis was done on an anatomical articulator, together with a clinical examination of the occlusion and a study of the mandibular movements.

As a result of these investigations the author concludes, that the adult dentition is subject to continuous change. The occlusal changes apparently correspond with the particular gliding movement; while in form and localization these changes are alike in cases with the same movement pattern.

The author describes the various types of movement and classifies them into five types. These are then related to the occlusal changes, and the influence of restorations on these movements and resultant changes in the occlusion are considered.

The paper is illustrated by one hundred and eighty excellent photographs of study models, together with clinical photographs and radiographs.—Beyron, H. (1953), *Svensk tandläk. Tidskr.*, **45**, 119.

Some Aspects on Comforters and Dental Caries

This paper is based on a study of thirteen hundred children in Malmö, Sweden. Their age group ranges from 10 months to 5 years.

These children were examined and their dental condition classified in three grades. Their "comforter" ["dummy"] habits were recorded as also was an indication of the quantity of sweets consumed.

The authors point out that comforters are much more commonly used by children of the lower-income group families than by those of the well-to-do. In consequence they may be more prone to caries owing to a greater lack of oral hygiene, a more caries-producing diet, etc. However, their findings indicate a significant association between the use of a comforter and an increased caries incidence, with a marked increase when a sugar-coated comforter has been used. There is even an almost significant statistical association between those children who have never used comforters and those who had ceased to use them by the time they were ten months old; but the authors do not feel that it can be proved by their investigation that this is due entirely to the comforter.

Finally they show how their findings are supported by the typical caries pattern for the "sweetened comforter" children, i.e., greater anterior caries than posterior, while the incisors are attacked buccally and lingually rather than interproximally.—Syrrist, A., and Selander, P. (1953), *Odontol. Tidskr.*, **61**, 237.

Studies on the Setting of Plaster-of-Paris

The paper is divided into four sections. The first deals with the volume changes in the plaster. The author discusses the factors affecting the expansion, strength, etc., and gives his explanation of how these changes are brought about.

The second section deals with the stability of plaster-of-Paris in humid air, and discusses the importance to the dentist of the conditions under which he stores it. The author also states that it should be supplied by the manufacturers in air-tight containers, and appeals for standardization in the preparation of the plaster.

In the third section, the author deals with the solubility of gypsum in relation to the particle size and when aqueous salt solutions are added. He also gives some photographs of the effect on plaster models of pouring a

quantity of boiling water on them which corresponds with the average amount used in "boiling out" denture flasks. The damage done shows that the popular belief that model plaster is insoluble in hot water is in fact erroneous.

The final section gives a critical review of the previous theories for the setting of plaster-of-Paris. The author presents his own theory and gives the basis on which it is formulated. Finally, he considers the factors affecting the setting rate of plaster.

The paper contains the result of numerous experiments and carries a comprehensive bibliography.—JØRGENSEN, K. (1953), *Odontol. Tidskr.*, **61**, 305.

How to Avoid, by Modern Methods of Physiotherapy, the Strain and Reduced Working Capacity Caused by Movement Anomalies in the Work of Dentists

In this paper, presented as part of a symposium on "Posture in Industry" given at a recent international congress on physiotherapy, the author analyses the strains which might be imposed by the positions adopted by dentists in performing their work, and advises upon ways in which they can be prevented.

Operating a foot control to a dental engine from the standing position makes it impossible to distribute the weight of the body equally on both feet, if one is to maintain full control of the engine. Unconscious locking of the knee occurs when the operator becomes tired, and this produces strain upon the knee cartilage, together with a constant stretching of the soft tissue of the posterior part of the knee. The flow of nourishment is also checked, and dilated veins ensue. This trouble can be prevented by unlocking the knee and moving the weight on to both feet as soon as the foot control is not being used.

When standing on both feet they should not be placed too wide apart except when force is being applied in the performing of certain dental operations.

The author also considers that the dentist should stand close to his patient in order to avoid his lower back forming a long lever and so preventing relaxation of the back muscles.

Leaning sideways may produce depression of a lung and so a dentist should be prepared to move around his patient.

The author, however, is greatly in favour of a dentist operating from a sitting position and advises that the operating stool should be fitted with a foot-rest and also a back, but he considers that the dentists should not always be handed his instruments by an assistant, as fetching them himself helps him to keep fit.

Recommendations are made with regard to footwear, these being lace shoes with leather soles with proper support for the instep, rather than slippers or sandals.

Correct selection of instruments is also significant in avoiding different adverse muscular tensions and joint stresses in the hands.

It is perhaps gratifying to learn that most dentists are apparently amenable to the suggestions of physiotherapists and prove to be good patients.—ØSTLI, A. (1953), *Physiotherapy*, **39**, 299.

Investigations on Dental Precision Casting

The writer starts by defining what is meant by casting precision and then goes on to demonstrate the conditions which must be fulfilled to obtain this result.

He states that precision is dependent upon: (1) The size and type of the preparation. (2) The angle of convergence between the opposite preparation surfaces. (3) The compressibility of the tooth substance and the casting metal. (4) The casting technique. These points are dealt with individually and illustrated by numerous experiments.

The results of two of these series of experiments are of particular interest. In one, he demonstrates that the tensility of the wax affects the effective expansion of the investment, and to obviate this he recommends the hygroscopic method using water at 45°–50° C. The second series of experiments show the undesirable and unpredictable effect of the casting ring on the expansion and also points out how even the position of the asbestos in the ring alters the degree of expansion.

The paper is concluded with a suggested casting technique using the hygroscopic method and replacing the conventional metal

ring by a cylinder of paper. This technique has been used at the Royal Danish Dental School for about a year and the results have proved to be more satisfactory than by any other method tried there.—JØRGENSEN, K. DREYER (1953), *Göteborgs tandläk. Sällskaps Artikelseria Arsbok*, 1.

A Critical Review of Clinical Cephalometric Radiography

The literature on cephalometrics is briefly and critically reviewed and the attempt throughout to establish a norm or standard is apparent.

Studies at Northwestern University have shown the broad range of combination of cranial and facial components. To accept a mean as an absolute treatment goal is to ignore a majority of the populace. Our goal must be, then, an individualized norm, using group standards only as a guide. Relations of facial components vary broadly, depending on the facial type—whether the face is forward divergent or backward divergent —whether the face is concave or convex. The implication here is that there are two major considerations, the position of the maxilla anteroposteriorly in the face (with reference to the cranium), and the relation of the mandible to the maxilla, which is responsible for the convex, straight, or concave profile line. If the maxilla is protracted in its relationship to the cranium, the profile is more likely to be convex. If the maxilla is retracted, the profile is more likely to be concave. However, with a maxillary protraction, the face can be convex, straight, or concave. The same holds true in a face where the maxilla is retracted in relation to the cranium. This is further complicated by an appraisal of general facial type. From our studies of clinically excellent occlusions, it would appear that the apical base difference (maxilla to mandible) is routinely greater with the maxilla protracted in relation to the cranium. There is a markedly greater tendency toward facial convexity and incisor procumbency. With maxillary retraction, the incisor teeth seem to be more upright over basal structures. The anteroposterior apical base discrepancy here is consistently less.

The mandibular incisors may have an inclination of 85, 90, 95, or 99 degrees and still be normal, depending on facial type and maxillomandibular relationship. The clinical impression of the validity of the mandibular plane angle as a prognostic guide would not appear to be substantiated in Class II malocclusions on the basis of the degree of anteroposterior basal dysplasia, the most important characteristic of a Class II (Angle) malocclusion. It follows, then, that the changing of the inclination of the lower incisors because of the steepness of the mandibular plane in a direction that will only increase the overjet and overbite in severe Class II malocclusions, irrespective of inherent pattern, irrespective of the position of the maxilla and maxillary incisors, irrespective of the balancing muscular forces, and irrespective of the possible creation of temporomandibular joint pathology, might be open to some question. This is further substantiated by cephalometric evidence demonstrating insignificant basal changes as a result of conventional orthodontic therapy, limited to intra-oral appliances.

As Downs has done, the Northwestern analysis is divided into two parts, skeletal and dental. Recognition is made of those areas which influence prognosis and treatment, and of those areas susceptible to orthodontic therapy. The skeletal measurements are the angle of facial convexity (N-A-P), the mandibular plane angle, and the apical base relationship. The use of the maxillary and mandibular incurvations (points A and B) as the anterior termini of the maxillary and mandibular apical bases would appear to be justified, based on clinical experience. By constructing an angle from the S-N plane to points A and B, and taking the difference, the maxillo-mandibular anteroposterior relationship can be seen. If the SNA angle is high, meaning a maxillary protraction, then the apical base difference can be higher and still not have unfavourable therapeutic connotations. If the SNA reading is low, any appreciable apical base difference may impose severe limitations on the adjustment of the Class II relationship. The angle of the mandibular plane to the sella-nasion plane is measured.

Steep mandibular plane angles impose severe limitations on the correction of excessive overbite; occlusal plane changes induced by intermaxillary elastics are seldom permanent; functional disturbances are more likely.

The denture analysis is a study of the area and structures the clinician can influence. The angulation of the upper incisor to the N-S or cranial plane is measured. Its axial inclination and anteroposterior position in the face are important in an analysis of the individual problem. A Class II, Division I, malocclusion with upright incisors and no spaces is an entirely different problem to treat than the same class malocclusion with the same amount of overjet, but with labial inclination and spacing of maxillary incisors.

The inclination of the lower incisor to the mandibular plane is recorded. Studies at Northwestern have shown a broad range of lower incisor inclination in individuals with clinically excellent occlusion, with an even larger standard deviation than the inclination of the maxillary incisor. This means that the mandibular incisor is more variable in its inclination than the maxillary incisor in individuals with clinically excellent occlusion. Any value, however, must be conditioned by the skeletal phase of the analysis. An apparently normal or erect lower incisor in a backward divergent face with a Class II malocclusion and high apical base difference presents an entirely different problem for treatment than it would in a forward divergent face, with a Class I malocclusion and a small anteroposterior basal difference. The same standard cannot be used.

Of necessity, mean values have been determined for all these criteria, along with standard deviations to show relative spread. But these measurements serve only as a guide, illustrating central tendency. Prognosis and treatment considerations must be based on the relations of the component parts within the particular patient under consideration.

From the analysis of contrasting cases the author concludes that there are certain severe Class II malocclusions incapable of full correction, where attempts at restoration of an ideal occlusion may well produce permanent damage. These cases, and their less severe brethren where ideal treatment may be no more stable, should be recognized prior to therapy. Carried one step further, there are undoubtedly an undetermined number of cases in treatment in which extraction of two upper biscupids, permitting retraction of the upper anterior segment to provide a normal overjet, confers greater stability and functional equilibrium, despite a Class II buccal segment relationship. Attempts to obtain Class I interdigitation at all costs in Class II malocclusions with a severe basal dysplasia may not only court failure, but also create future problems for the periodontist and prosthodontist.—GRABER, T. M. (1954), *Amer. J. Orthodont.*, **40**, 1.

The Structure and Function of the Mandibular Joint

Nineteen fresh post-portem specimens were subjected to a variety of investigations. Four zones of the disk are distinguished, two thick, joined by a thinner section, and the most posterior a bilaminate zone having a few elastic fibres in the upper lamina only, which attaches the disk to the squamotemporal suture: the lower lamina attaches the disk to the condyle posteriorly. The anterior edge of the disk makes up a deficiency in the capsule and provides attachment to condyle, temporal bone, and lateral pterygoid. Polar attachments are shared with the capsule, which, blending anterolaterally with the temporomandibular ligament, ensures co-aptation of the joint surfaces. Weaker capsular attachments to temporalis and masseter may restrain medial component of pterygoid action on disk.

In occlusal position posterior thick zone lies on anterior slope of condyle, and further retrusive movement carries disk back with condyle. In opening, stationary rotation of condyle on internal axis carries it forward on to thin zone of disk which moves forward on eminentia. Extension of upper lamina of posterior zone limits movement of disk, and condyle then jumps across anterior zone. The disk is returned on closing by means of elastic element of bilaminar zone and polar attachments.—REES, L. A. (1954), *Brit. dent. J.*, **96**, 125.

BOOK REVIEWS

SURGERY FOR DENTAL STUDENTS. By MICHAEL F. A. WOODRUFF, M.D., M.S. (Melb.), F.R.C.S., Professor of Surgery in the University of Otago, N.Z. With a Foreword by S. H. WASS, M.S. (Lond.), F.R.C.S., Surgeon, Guy's Hospital. $5\frac{5}{8} \times 8\frac{3}{4}$ in. Pp. 326 + viii, with 108 illustrations. 1954. Oxford: Blackwell Scientific Publications. 30s.

PROFESSOR MICHAEL WOODRUFF, who has recently left this country to become Professor of Surgery at the University of Otago in New Zealand, is to be congratulated on the excellent production of this very much needed text-book on surgery.

This book is based on a course of lectures in general surgery delivered to dental students over a period of some years, and is a very full and detailed description of the essential basic principles of surgery. The author has written in a very easy and readable fashion, and has endeavoured to impress the student at all stages of the book with the fact that dental surgery should always be looked upon as a special branch of general surgery. All the underlying pathological facts which interest the general surgeon have been presented to the reader, inflammation, injury, repair, and tumour formation being dealt with in detail. Professor Woodruff has taken the opportunity to discuss those modern advances in the treatment of disease which have so greatly changed the outlook for many patients to-day. The antibiotics and chemotherapy are discussed in much detail, with particular reference to their uses in the treatment of osteomyelitis and other infections, and the various complications to be guarded against during their use are described in full.

The many excellent diagrams, illustrations, and X-ray films have helped to simplify the study of this book, and there is no doubt that a student who reads and understands this book will be provided with all the essential background to the practice of dental surgery in his future professional career. It has been a great pleasure to read this new volume and it can be safely predicted that it will come to occupy an important place amongst the standard text-books for dental students.

A. M. A. M.

ORAL HYGIENE. By RUSSELL W. BUNTING, D.D.Sc., Professor of Dentistry and Dean of the School of Dentistry, Emeritus, University of Michigan, and collaborators. $6 \times 9\frac{1}{4}$ in. Pp. 283, with 204 illustrations, and 1 coloured plate. 1954. Second edition. London: Henry Kimpton. 42s.

ALTHOUGH this book is labelled a second edition it can almost be regarded as a first edition and has, in fact, been given a new title. Professor Bunting's name appears as the author of this work, but eight of the twelve chapters have been written by collaborators. These writers are Lester W. Burket, Allen O. Gruebbel, Dorothy G. Hard, Harold W. Held, Philip Jay, Donald A. Kerr, Hamilton B. G. Robinson, and Jacob M. Wisan, all of whom are authorities of considerable repute on different aspects of dentistry. With such a strong team one might expect an extremely sound exposition of the subject-matter which the editor has decided to include in this work. This is indeed the case, and though there are certain features with which some will disagree these are remarkably few and not of great magnitude.

This text-book is intended for the teaching of dental hygienists, and, after sections on anatomy and physiology, consideration is given to accretions on the teeth, caries, periodontal disease, stomatitis, and finally oral prophylaxis in its widest sense. Though sound, some of these are possibly a little too complex. The three concluding chapters are devoted to the role of the dental hygienist in public health, dental health education, and a survey of the status of the dental hygienist together with information about her training. All of this makes most interesting reading, but it must be appreciated that the information applies to the United States of America only.

Few adverse criticisms are necessary. It does, however, seem regrettable that the photographs used to illustrate tooth morphology

are so mixed that they will be of doubtful assistance to the student. It would have been better if the teeth chosen had all been taken from the same side. Also the use of different terms for the same thing in different parts of the book would have been better avoided.

The quality of the printing, illustrations, and binding is of the high standard which is always associated with the name of the publishers and the price must be considered reasonable. A. B. W.

PRACTICAL PEDODONTIA OR JUVENILE OPERATIVE DENTISTRY AND PUBLIC HEALTH DENTISTRY. By FLOYDE EDDY HOGEBOOM, D.D.S., F.A.C.D. With special chapters by FORREST ANDERSON, HAROLD HAWKINS, THADDEUS P. HYATT, and HARRY E. STRAUB. Sixth edition. $6\frac{1}{2} \times 9\frac{1}{2}$ in. Pp. 642, with 588 illustrations. 1953. London: Henry Kimpton. 93s. 6d.

THE book covers an extraordinarily wide field from the economics of dental practice through embryology, various operative procedures, prosthetics, endocrinology, to finally a long chapter on public health and dentistry.

One's first reaction on opening the book is that it will be useful and informative, but on closer reading there is such a mass of detail, much of which cannot be regarded as up to date, that it becomes tedious.

The illustrations cannot be regarded as up to present-day standards. Certain stimulating and interesting statements are not covered by references, which is a great pity, while the references which are quoted in many cases are not the most up to date.

The chapters concerning operative dentistry are disappointing. Far too much space has been given to detailed instructions concerning laboratory techniques and descriptions of the various materials used in these techniques.

Chapter XIII, "The Adolescent with Interproximal Caries", is instructive and well arranged. Chapters XVIII, "The Biochemical Aspects of Preventive Dentistry", and XIX, "Prevention of Dental Caries by Nutrition", are very interesting and well presented, and in the opinion of the reviewer are probably the best chapters in the book.

Generally, it is not a book which one would unhesitatingly recommend, although it does contain some useful information. A. M. H.

NATIONAL HEALTH SERVICE NOTES

The National Health Service (General Dental Services) Regulations, 1954

THESE Regulations came into force on June 15.

The Regulations differ in some small particulars from those which they replace. The changes, which have been agreed with the British Dental Association, consist mainly of clarifications of wording, but they also include the following changes of substance.

Regulation 4(5): This paragraph removes from Executive Councils the obligation to send copies of dental lists to certain bodies except when the body so requests.

Third Schedule: Injections of Procaine Benzylpenicillin, with or without Benzylpenicillin, are added to the list of drugs which dentists may prescribe for their patients and which will be dispensed to the patient by a chemist on payment by the patient of the usual prescription charge.

Fifth Schedule, Item 1: This Regulation extends the provision made in Regulations in 1953 regarding the number of times on which the fee for clinical examination and report may be claimed in respect of an expectant or nursing mother. A fee may now be claimed for one examination additional to the number for which a fee may normally be claimed and all these examinations may be carried out during the period of pregnancy and twelve months thereafter.

Item 3: A fee for Silico-phosphate fillings is laid down. It is the same as that for Silicate fillings.

Item 22: This item gives formal authority to the Dental Estimates Board to authorize payment of the fee for arrest of bleeding even when the bleeding does not follow dental treatment provided under the general dental services.

Part III: This permits the use of silico-phosphate cements and clarifies and amends the circumstances in which different filling materials may be used. Silicate and silico-phosphate cements or self-polymerizing acrylic resin filling materials, as may be suitable in the particular case may be used without prior approval in anterior teeth and also in first and second premolars where the occlusal surfaces are not involved. The prior approval of the Board *must* be obtained if it is desired to use these materials on the occlusal surfaces of premolars or for any cavities in molar teeth.

Cements, gutta-percha and copper amalgam may be used without restriction in deciduous teeth, but the prior approval of the Board *must* be obtained if it is desired to use these materials in special circumstances in permanent teeth.

For the purposes of this paragraph cements are to be taken to include all filling materials which consist of powders in combination with liquids other than mercury.